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PROPOSAL FOR

RAPID INTERPRETATION PRINTER-PROCESSOR

Proposal No.: CLD 883

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Prepared by: STAT

INTRODUCTION

The objective of this program is to provide a capability for rapidly copying selected frames or sections of a roll of aerial reconnaissance film while it is being viewed on a light table. The particular light table of interest is the Richards GFL-940 MCE elevating light table. This program includes the design, fabrication, installation, and test of all components required to expose and process the copies.

The potential uses of this copying capability are numerous. Several uses that readily come to mind are:

a) An interpreter, performing a screening function, can, upon arrival at an area that warrants more detailed examination, copy the area and provide the copy to another interpreter who then examines the area in greater detail. The detailed examination of selected areas can then proceed while the screening function is still in progress.

b) An interpreter scanning a roll of film can select and rapidly copy those frames pertinent to his analysis. He can then release the roll to other interpreters who are similarly engaged in other analyses.

c) An interpreter may wish to copy a selected area for special annotation or for inclusion in his report.

The performance of this copying function through the use of the Diazo process is particularly attractive because of the following reasons:

a) The entire operation, both exposure and processing, can take place at the light table without the interpreter or the film having to leave the table.

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b) A high resolution, dry copy of the original is available for use in less than a minute.

c) Danger of damage to the original film is minimized since it need not be removed from the light table, installed on a printer, and replaced on the light table.

d) No bulky and expensive printing and processing equipment, with their attendant operating and maintenance personnal, are required.

GENERAL DESCRIPTION

Figure 1 provides an overall view of the Richards GFL-940 MCE Light Table as modified to provide the Diazo copying and processing capability. The major features of the unit and their characteristics are:

Viewing Area - The viewing area is basically the same as the standard table except in terms of size and brightness. The present light source will be removed and will be replaced by an Aristo Cold Light Grid, measuring approximately 10.5 inches by 29 inches. Thus, the viewing area will be 10.5 inches by 29 inches and will occupy roughly the left three quarters of the light table.

The brightness level of the viewing area will be increased from the present 900 - 1000 foot lambert range to 1400 - 1600 foot lamberts. The existing power supply will be used with the new light source so that the full light dimming range will be retained.

The clear glass and the diffusing material presently on the light table will be cut to the corresponding length of about 29 inches

Copy Stage - The stage will occupy the 11 inch by 11 inch by 4 inch volume at the extreme right end of the light table housing. It will accept Diazo cut film formats up to 9.5 inches by 9.5 inches and expose copies with resolutions in excess of 200 lines per millimeter in less than 15 seconds. The operation of the copy stage is similar to most contact printers and, thus, simple and straightforward. A hinged pressure platen, with a pneumatic diaphragm

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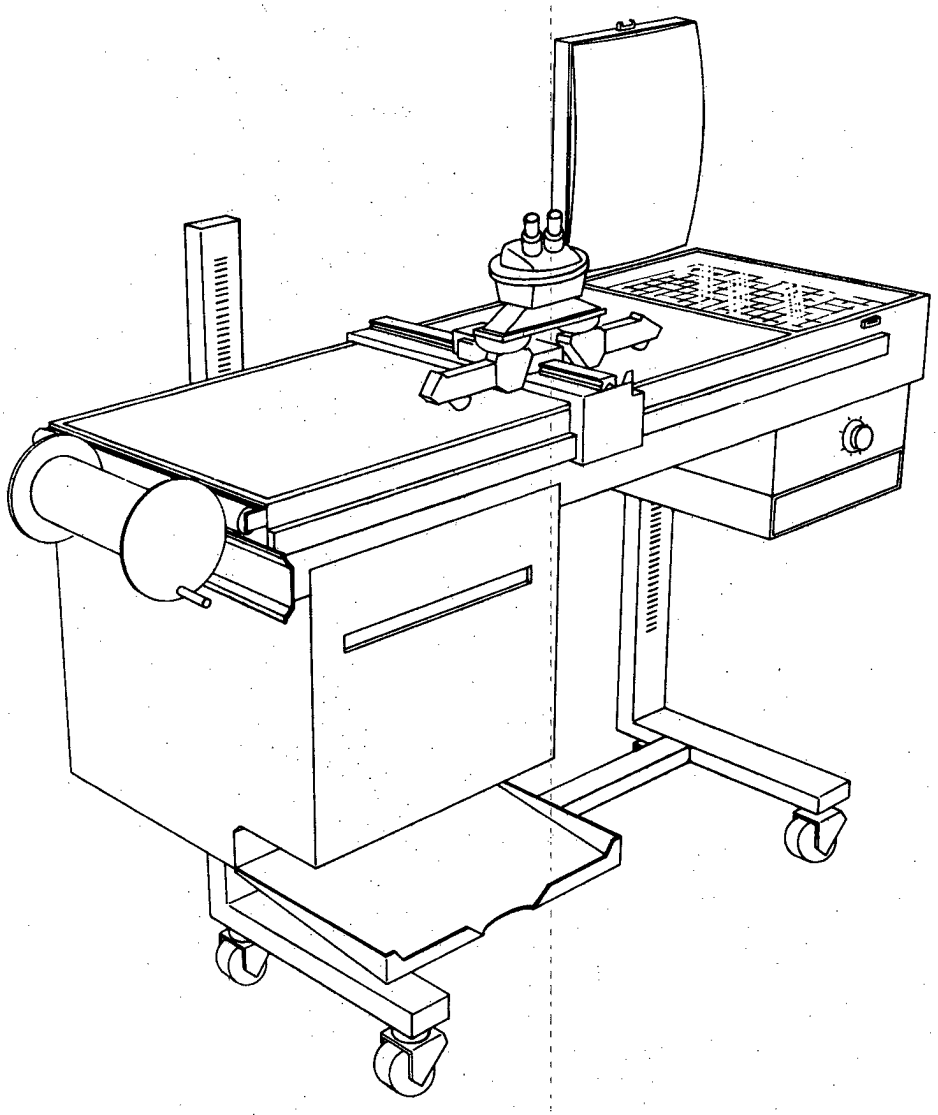


Figure 1 [redacted] Rapid Interpretation Printer - Processor STAT

holds the original and the Diazo material in emulsion to emulsion contact during exposure. When the interpreter selects an area to be copied, he transports the area to the copy stage, places the Diazo material with the sensitized face down on top of the original, closes the pressure platen, sets the desired exposure, and presses the "Expose" button. When the exposure has been completed, a signal lamp goes off and the exposed copy can be removed and inserted into the Processor.

The light source selected is an Xenon grid lamp that is pulsed to provide the desired exposure. The degree of exposure is controlled by selecting the number of pulses (1 to 15 at a frequency of one pulse per second) desired. Our experience shows that the average time will be 3 to 5 seconds. A special lamp power supply converts the standard house power to the high voltage required. The exposure lamp will be interlocked with the pressure platen to prevent accidental flashing of the lamp when the platen is not locked in the exposure position.

The high resolution required for the successful duplication of aerial reconnaissance film makes collimation of the light source necessary. The degree of collimation required can be determined as follows:

A resolution element is 9.8×10^{-5} inches at 200 lines/mm.

Film emulsion thickness is 2.5×10^{-4} inches average.

Diazo emulsion thickness is 2.5×10^{-4} inches average.

Assuming a resolution element must retain two-thirds its dimension during copying then,

$$\text{Tan } \phi = \frac{9.8 \times 10^{-5} + 1/6\ (9.8 \times 10^{-5})}{2(2.5 \times 10^{-4})} = .23$$

Collimation Angle (ϕ) = $12^{\circ}57'$

This degree of collimation, while not difficult to achieve, is necessary to achieve the resolution desired. This collimation will be provided by a thin-walled aluminum honeycomb having gratings approximately 0.25 inches apart. This collimating honeycomb will be located between the grid lamp and the exposure surface. The thickness of the honeycomb is governed by the size of the grating and the degree of collimation as follows:

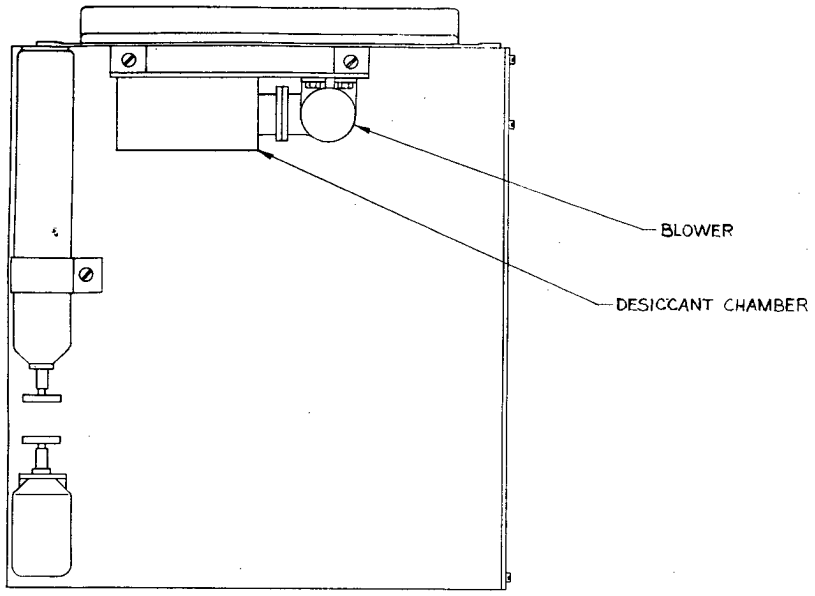
$$\text{Tan } 12^{\circ}57' = \frac{.25}{x}$$

$$.23x = .25$$

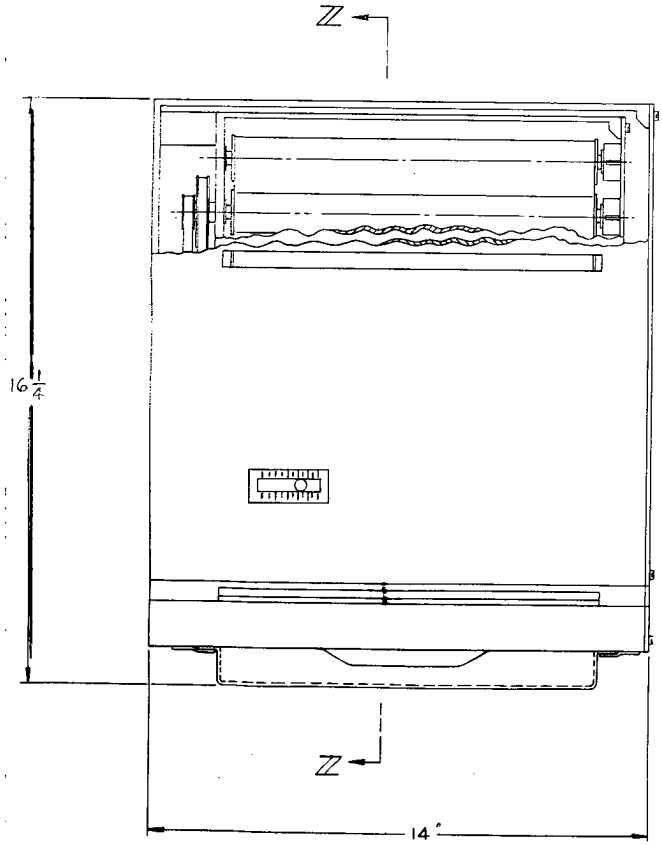
$$x = 1.08$$

Thus, a honeycomb collimator approximately 1.1-inch thick will be used. It will be positioned about .25 inches below the exposure surface to avoid shadow areas as a result of the partition thickness. The exposure surface will be a quartz glass plate, flush with the light table surface, upon which the film is supported during exposure. Quartz was selected for this purpose because of its excellent transmission characteristics in the wavelength of interest (approximately 96%).

Processor - Figure 2 shows a layout of the Processor which will be located under the left end of the light table. The Diazo



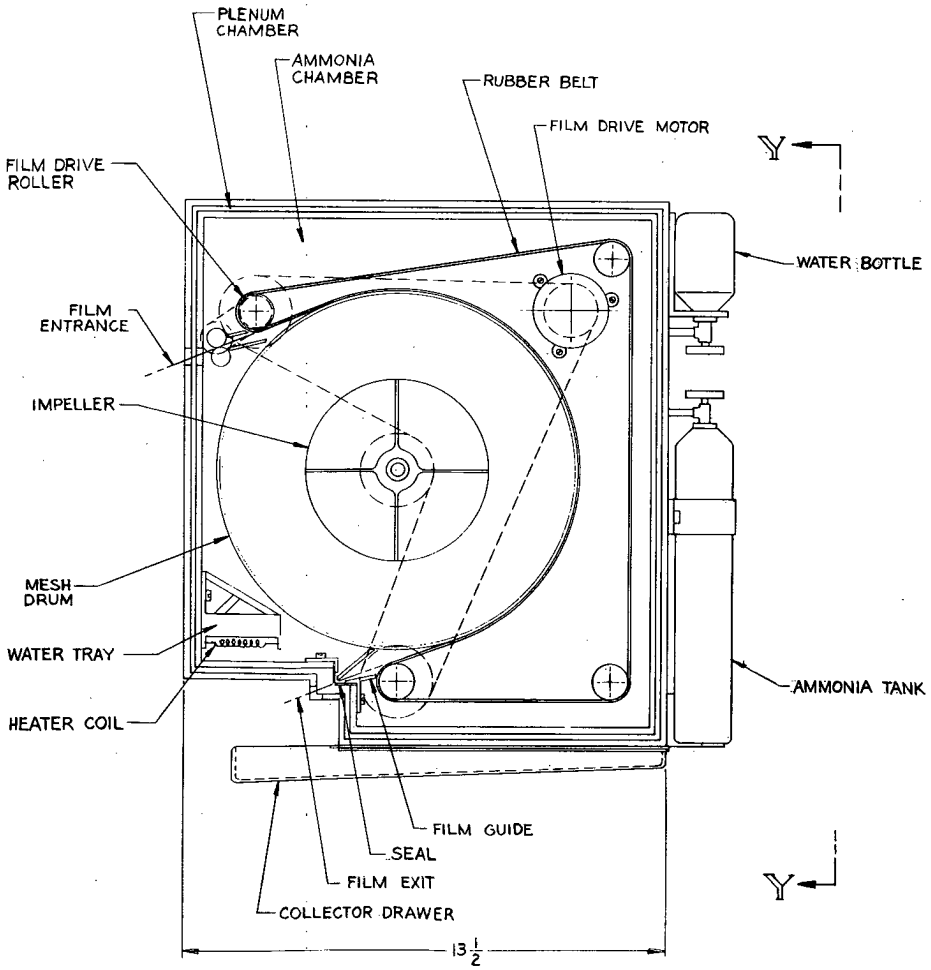
VIEW Y-Y



FRONT VIEW

Figure 2

Layout Drawing - Processor



SECTION Z-Z

material enters the developing chamber through soft/rubber rollers which propel the material to the point of contact with the drum and act as a seal to contain the ammonia vapor within the developing chamber. A pair of soft rubber lips seal the exit area. The Diazo material entering the chamber is drawn between the continuous rubber belt and the rotating, stainless steel, mesh drum. Water and anhydrous ammonia are trickled into a small trough-like container where they are heated so that the resulting vapors permeate throughout the chamber. These vapors are blown against the exposed Diazo material through the action of the impeller. At the end of the processing cycle (less than 30 seconds), a wiper blade peels the film from the drum and guides it out through the exit lips where it drops into a collecting tray. Thus, once the exposed material has been inserted into the Processor, the operator need not devote further attention to it since it will drop into the collecting tray at the completion of processing. When not in use, the collecting tray which is mounted on slides, can be repositioned under the Processor so that it is out of the way.

A plenum chamber exhaust system draws air from around the openings of the ammonia chamber to collect any gases that may escape. The gas and air thus collected are passed through a dessicating filter where all traces of ammonia are removed such that the exhaust has none of the characteristic smell of ammonia. It can then be exhausted into the room environment without fear of irritation or discomfort to the operating personnel.

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Storage Drawer - A small storage drawer approximately 10 inches by 10 inches by 1 1/2 inches will be located under the present light table power supply on the right end of table. It will provide storage space for 100 sheets of the unexposed Diazo cut film.

Power Requirement - The Rapid Interpretation Printer Processor, including the Viewing Stage, the Printer and the Processor, will operate on 115 VAC, 60-cycle power and will draw a maximum of 9.5 amperes current.

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PROGRAM PLAN

It is the intention of [redacted] to make the proposed modifications on three customer-furnished Richards GFL-940 MCE Light Tables. All added features will be contained within the present envelope of the light box and its elevating table.

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The program schedule and milestones are shown in Figure 3. As noted, delivery of the first unit will be nine (9) weeks after the contract start, and the second and third units will follow one (1) week later.

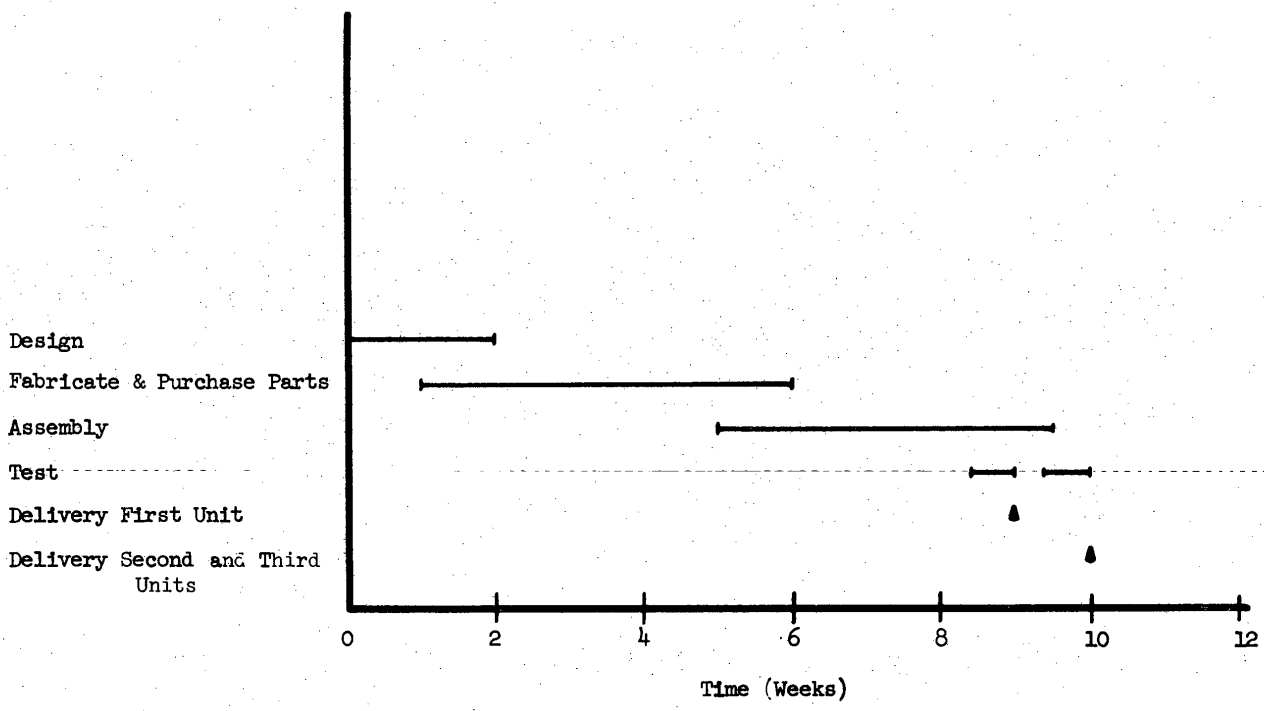

Figure 3 Program Schedule

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PROGRAM COSTS

The costs associated with the performance of this program are presented in three areas as follows:

(a) The engineering design, fabrication, installation, and test of a complete Diazo copy and processing capability on a Richards GFL-940 MCE Light Table.

(b) The fabrication, installation, and test of a complete Diazo copy and processing capability on a second Richards GFL-940 MCE Light Table.

(c) The fabrication, installation, and test of a complete Diazo copy and processing capability on a third Richards GFL-940 MCE Light Table.

(d) Cost per 100 sheets of 9 1/2 inch by 9 1/2 inch 5 mil Diazo raw stock.

The costs of (a) and (b) are based upon the availability of three Richards GFL-940 MCE Light Tables as GFE for modification under this program.